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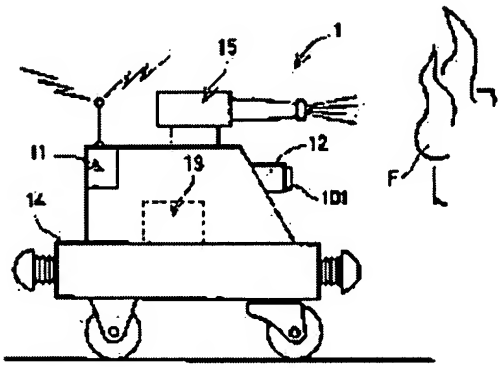
(54) FIRE ROBOT AND FIRE FIGHTING SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a fire robot which can automatically run and a fire fighting system using the fire robot.

SOLUTION: This fire robot 1 has an all-weather type body, in which a communication means 11 for receiving a fire alarm and communicating information on the progress of fire fighting, a detecting means 12 for detecting the surrounding situation, a fire source determining means 13 for determining the source of the fire based on the result of detection, an automatic moving means 14 by means of wheels or a caterpillar, etc., and a fire extinguishing means 15 for extinguishing a fire are stored. An infrared ray detection device 101 is installed inside the detecting means 12, with the infrared ray sensing surface facing in the direction of progress of the moving means 14. As for the infrared ray detection device 101, such a device as has an infrared ray sensing means and is formed by the process of manufacturing semiconductors is preferable.



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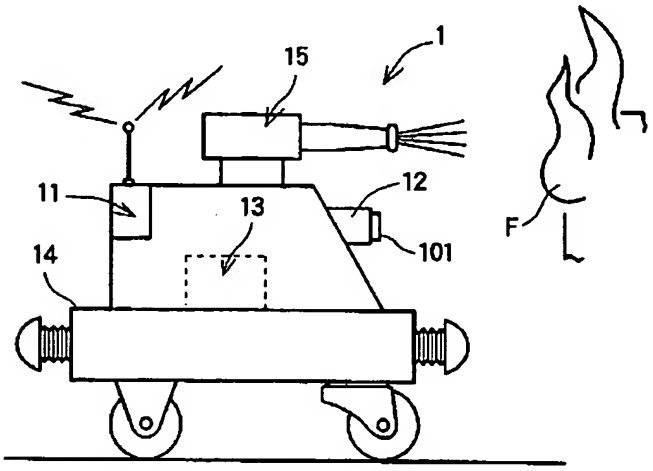
CLAIMS

[Claim(s)]
[Claim 1] The fire-extinguishing robot characterized by to constitute from an infrared detection means to detect the infrared radiation which carried out incidence, a decision means determine the source of a fire based on the infrared distribution within the detected visual field, a migration means move toward the determined source of a fire, and a fire-extinguishing means of the source of a fire, scanning the inside of a fixed visual field in length and a longitudinal direction.
[Claim 2] The fire extinguishing system characterized by establishing and constituting the transmitting means for notifying the location of the source of a fire to a fire-extinguishing robot at least in said fire detector while establishing a receiving means to have been the fire extinguishing system which consists of a fire-extinguishing robot and a fire detector according to claim 1, and to receive fire information in said fire-extinguishing robot.
[Claim 3] The fire extinguishing system according to claim 2 characterized by attaching and constituting an infrared detection means to detect the infrared radiation which carried out incidence, and a decision means to determine the source of a fire based on the infrared distribution within the detected visual field while scanning the inside of a fixed visual field in length and a longitudinal direction to said fire detector.
[Claim 4] The rocking seating rim which attached said infrared detection means in the outer frame through the supporting beam which consists of an elastic member, and set the 1st revolving shaft as this supporting beam and which can be inclined, The rocking object which attached in this rocking seating rim through the supporting beam which consists of an elastic member, and set as this supporting beam the 2nd revolving shaft which intersects perpendicularly with the 1st revolving shaft and which can be inclined, The infrared sensing means formed in this rocking object, and the 1st coil which said rocking seating rim is wired [coil] and makes a rocking seating rim incline, the [which made the 1st coil and the 1st revolving shaft, and the sense of magnetic flux cross at right angles] -- the [which made 1 permanent field, the 2nd coil which said rocking object is wired / coil / and makes a rocking object incline, the 2nd coil and the 2nd revolving shaft, and the sense of magnetic flux cross at right angles] -- the fire-extinguishing robot according to claim 1 characterized by constituting from a 2 permanent field.
[Claim 5] The fire-extinguishing robot according to claim 1 or 4 characterized by forming said infrared detection means according to a semi-conductor process.
[Claim 6] The rocking seating rim which attached the infrared detection means of said fire-extinguishing robot, a fire detector or a fire-extinguishing robot, and a fire detector in the outer frame through the supporting beam which consists of an elastic member, and set the 1st revolving shaft as this supporting beam and which can be inclined, The rocking object which attached in this rocking seating rim through the supporting beam which consists of an elastic member, and set as this supporting beam the 2nd revolving shaft which intersects perpendicularly with the 1st revolving shaft and which can be inclined, The infrared sensing means formed in this rocking object, and the 1st coil which said rocking seating rim is wired [coil] and makes a rocking seating rim incline, the [which made the 1st coil and the 1st revolving shaft, and the sense of magnetic flux cross at right angles] -- with 1 permanent field the

[which made the 2nd coil which said rocking object is wired / coil / and makes a rocking object incline, the 2nd coil and the 2nd revolving shaft, and the sense of magnetic flux cross at right angles] -- the fire extinguishing system according to claim 2 or 3 characterized by constituting from a 2 permanent field.
[Claim 7] Claim 2 characterized by forming the infrared detection means of said fire-extinguishing robot, a fire detector or a fire-extinguishing robot, and a fire detector according to a semi-conductor process, a fire extinguishing system according to claim 3 or 6.

[Translation done.]

Drawing selection drawing 1



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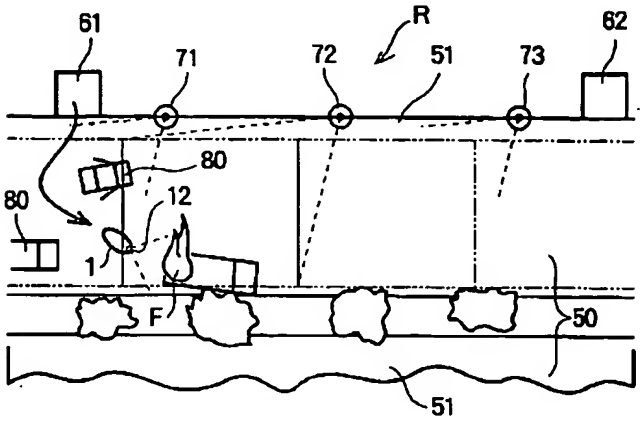

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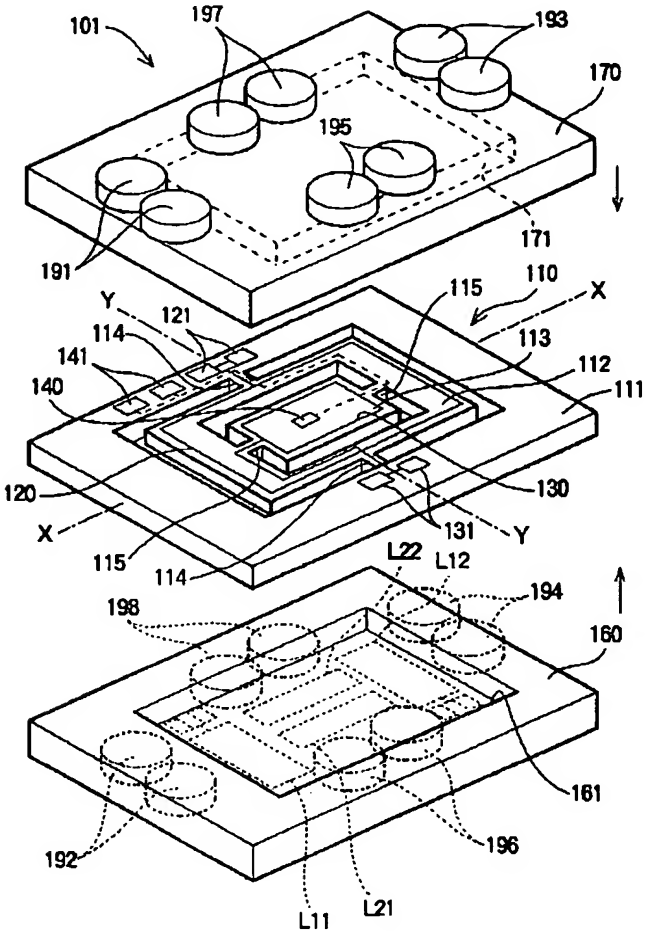

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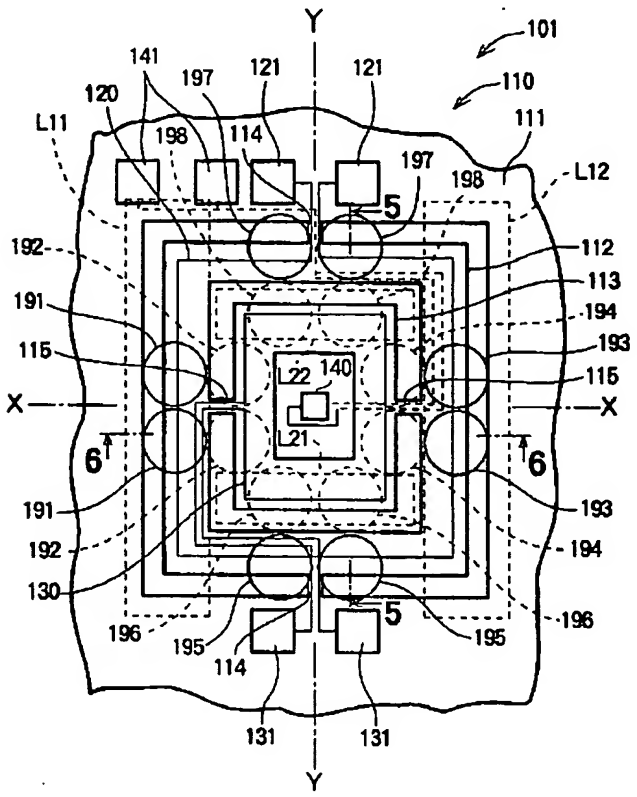

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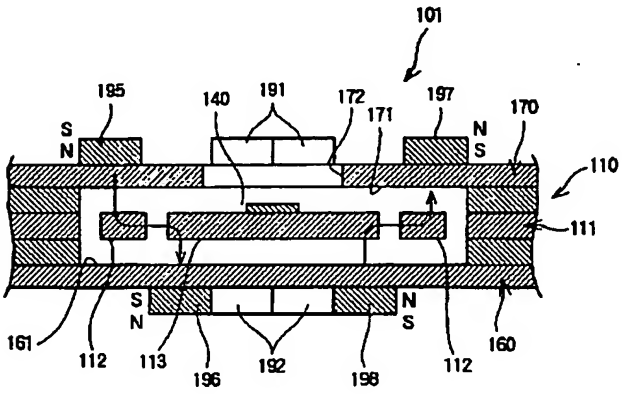

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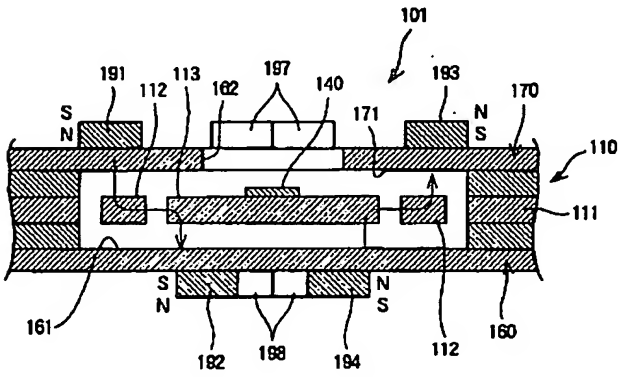

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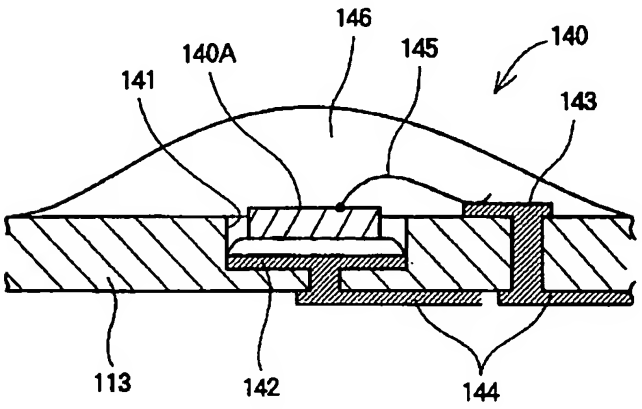

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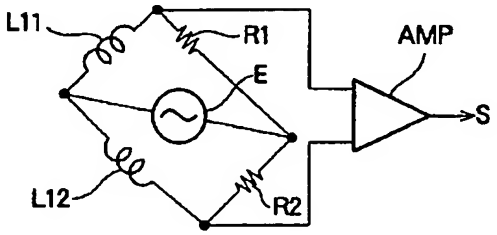

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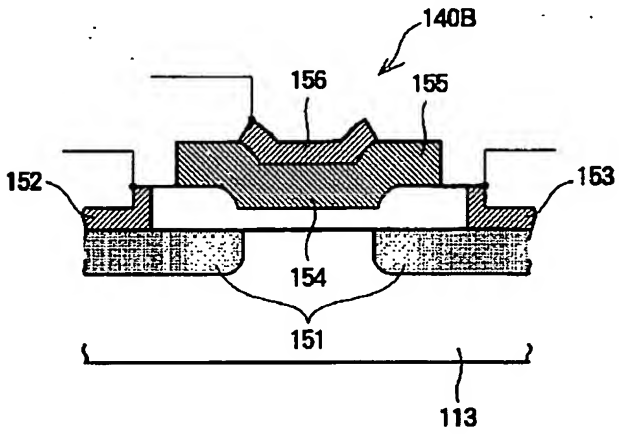

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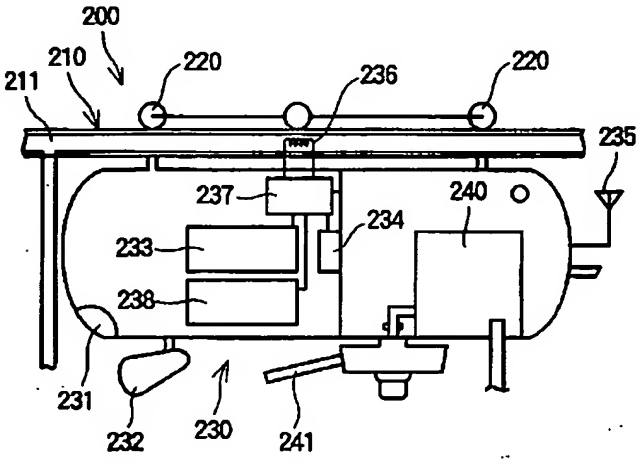

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the fire-extinguishing robot suitable for fire extinguishing of car fires which mainly break out outdoors, such as a highway, and the fire extinguishing system using this.
[0002]
[Description of the Prior Art] Conventionally, the infrared detection equipment which senses infrared radiation is known. Moreover, such infrared detection equipment is made to carry and the fire-extinguishing robot for arranging in a structure and extinguishing an indoor fire is proposed by JP,8-294544,A as "a robot facility for fires." Drawing 17 of this official report is re-**(ed) to a degree Fig. (however, it carried out swing direct [of the agreement]).
[0003] Drawing 10 is drawing showing an example of the conventional robot facility for fires. This robot facility 200 for fires is installed so that the internal surface of a tunnel may be made to crawl on a monorail 210, and it is made to run the robot 230 for fires through a wheel 220,220 on this monorail 210. The wiring 211 for electric supply is put side by side on a monorail 210, and drive power, such as a rotation driving source of a wheel 220, is stored in the built-in battery 238 through the power receiving object 236 and the power-source inverter 237 from this wiring 211 for electric supply.
[0004] this robot 230 for fires -- that point -- the detection means 231 of the source of a fire, and the monitor camera 232 for a monitor -- preparing -- the interior of a body -- a control unit 233 and a transmitter-receiver 234 -- the back end section -- an antenna 235 -- a body posterior part -- the hose reel 240 of firewater -- moreover, the body lower part is equipped with the monitor nozzle 241 for tail water, respectively. Said detection means 231 discovers the generated source of a fire, turning the detection side of infrared detection equipment to a lengthwise direction and a longitudinal direction by two built-in motors.
[0005] According to this robot facility 200 for fires, the management equipment which is not illustrated on radio can be told about the location of the source of a fire discovered in the tunnel, and the image of the monitor camera 232, making it run the robot 230 for fires quickly along with a monorail 210. Firewater can be introduced into coincidence from water supply opening in a tunnel through water receiving opening of a hose reel 240, water can be sprayed on it towards the source of a fire from the monitor nozzle 241, and a fire can be extinguished.
[0006]
[Problem(s) to be Solved by the Invention] However, there was a trouble described below in the above-mentioned fire-extinguishing robot and a fire extinguishing system. In order to turn the look of this kind of infrared detection equipment in the direction of arbitration, two built-in motors made to rotate this in all directions are needed. However, if fire extinguisher material including the hose reel and monitor nozzle for fire extinguishing is already carried in this robot for fire extinguishing and he is besides made to contain the motor which is a heavy lift, it is made to run a fire-extinguishing robot quickly, and he cannot be seen out to the source of a fire.

[0007] Furthermore, since drive power with these two big built-in motors was consumed, the mass battery had to be carried, the self-propelled control stabilized with this increment in weight became very difficult, and the fire-extinguishing robot was hung and used for the monorail. However, generally, since there were few wall surfaces which can fix transit tracks, such as a monorail, to the outdoors, a service space and an application will be restricted inevitably and removal of such a trouble was an important technical problem.

[0008] Then, the purpose of this invention is to offer the fire-extinguishing robot in which autonomous transit is possible, and the fire extinguishing system using this.

[0009]

[Means for Solving the Problem] The fire-extinguishing robot characterized by to consist of an infrared detection means detect the infrared radiation which carried out incidence, a decision means determine the source of a fire based on the infrared distribution within the detected visual field, a migration means move toward the determined source of a fire, and a fire-extinguishing means of the source of a fire, scanning the inside of a fixed visual field in length and a longitudinal direction in claim 1 of this invention in order to solve the above-mentioned technical problem constituted.

[0010] Therefore, since the infrared distribution within a fixed visual field is searched for by the carried infrared detection means, a decision means determines the source of a fire from the temperature information, and it becomes possible to make a fire-extinguishing robot approach the source of a fire.

[0011] In claim 2, it is the fire extinguishing system which consists of a fire-extinguishing robot and a fire detector according to claim 1, and while establishing a receiving means to receive fire information in a fire-extinguishing robot, it is characterized by having formed the transmitting means for notifying the location of the source of a fire to a fire-extinguishing robot at least in the fire detector, and constituting a fire extinguishing system in it. The fire extinguishing system characterized by things was constituted. Therefore, if a fire breaks out, a fire-extinguishing robot can be made to go to the location of the source of a fire immediately.

[0012] It is characterized by having attached an infrared detection means to detect the infrared radiation which carried out incidence while scanning the inside of a fixed visual field in length and a longitudinal direction, and a decision means to determine the source of a fire based on the infrared distribution within the detected visual field to the fire detector, and constituting a fire extinguishing system from a claim 3. Thereby, the source of a fire is spontaneously discoverable.

[0013] The rocking seating rim which attached the infrared detection means in the outer frame in claim 4 or claim 6 through the supporting beam which consists of an elastic member, and set the 1st revolving shaft as this supporting beam and which can be inclined, The rocking object which attached in this rocking seating rim through the supporting beam which consists of an elastic member, and set as this supporting beam the 2nd revolving shaft which intersects perpendicularly with the 1st revolving shaft and which can be inclined, The infrared sensing means formed in this rocking object, and the 1st coil which a rocking seating rim is wired [coil] and makes a rocking seating rim incline,

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[0011] In claim 2, it is the fire extinguishing system which consists of a fire-extinguishing robot and a fire detector according to claim 1, and while establishing a receiving means to receive fire information in a fire-extinguishing robot, it is characterized by having formed the transmitting means for notifying the location of the source of a fire to a fire-extinguishing robot at least in the fire detector, and constituting a fire extinguishing system in it. The fire extinguishing system characterized by things was constituted. Therefore, if a fire breaks out, a fire-extinguishing robot can be made to go to the location of the source of a fire immediately.

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[0013] The rocking seating rim which attached the infrared detection means in the outer frame in claim 4 or claim 6 through the supporting beam which consists of an elastic member, and set the 1st revolving shaft as this supporting beam and which can be inclined, The rocking object which attached in this rocking seating rim through the supporting beam which consists of an elastic member, and set as this supporting beam the 2nd revolving shaft which intersects perpendicularly with the 1st revolving shaft and which can be inclined, The infrared sensing means formed in this rocking object, and the 1st coil which a rocking seating rim is wired [coil] and makes a rocking seating rim incline, the [which made the 1st coil and the 1st revolving shaft, and the sense of magnetic flux cross at right angles] -- the [which made 1 permanent field, the 2nd coil which a rocking object is wired / coil / and makes a rocking object incline, the 2nd coil and the 2nd revolving shaft, and the sense of magnetic flux cross at right angles] -- it is characterized by constituting from a 2 permanent field.

[0014] For this reason, if a drive current is repeatedly given to the 1st and 2nd coils, by the interaction with a permanent field, each produces electromagnetic force efficiently and can incline a rocking object or a rocking seating rim smoothly. Thus, if a rocking object or a rocking seating rim can be inclined, the sense of an infrared sensing means is easily turned to length and a longitudinal direction, and the temperature information within a fixed visual field can be everywhere acquired with the infrared detection means. Therefore, it is not necessary to add the driving means of the motor which makes a rocking object incline.

[0015] In claim 5 or claim 7, it is characterized by forming an infrared detection means according to a semi-conductor process. This integrates the whole infrared detection means and a fire-extinguishing robot etc. is made into a small and lightweight configuration.

[0016]
[Embodiment of the Invention] The gestalt of operation of this invention is explained below based on an attached drawing. Drawing 1 is drawing explaining an example of the fire-extinguishing robot concerning this invention. This fire-extinguishing robot 1 does the loading receipt of the means of communications 11 which communicates a fire-extinguishing situation while receiving fire information, the detection means 12 of a surrounding situation, the decision means 13 of the source F of a fire by the detection result, the migration means 14 of the self-propelled mold by the wheel, an endless track, etc., and the fire-extinguishing means 15 of a fire into the body of an all-weather mold. Moreover, the buffer section to an obstruction is prepared in the order section.
[0017] An infrared detection means 101 to mention later was built in the detection means 12, and the sensing side of the infrared radiation is turned to the travelling direction of the migration means 14. Any are sufficient, although what was equipped with the infrared sensing means and formed according to the semi-conductor manufacture process as an infrared detection means 101, for example is desirable, in addition as long as it is lightweight small.
[0018] Generally, the intense black smoke accompanying combustion of motor fuel or oil sticks, it is a thing and a fireman's etc. field of view tends to be interrupted by fires, such as a highway, by this black smoke. However, since the infrared radiation from the source F of a fire tends to penetrate gas and smoke even if it is in the situation which is not effective at all, the fire-extinguishing robot 1 can observe the infrared radiation of each direction, and the source F of a fire can be discovered from the infrared distribution within a visual field.
[0019] The decision means 15 is equipped with a microprocessor, its control memory, and a circumference circuit, and each is connected to the system bus. Moreover, the decision means 13 by that exclusive software consists of the ambient-temperature storage section for the temperature information within a fixed visual field, the pyrosphere judging section based on this temperature information, and the migration directions section to the migration means 14.
[0020] Then, an operation of the fire-extinguishing robot 1 is explained. If the fire-extinguishing robot 1 is started, with the detection means 12, scanning the inside of a fixed visual field in length and a longitudinal direction, the infrared radiation of each direction will be detected and the infrared distribution within a visual field will be searched for. For this reason, even if it does not add anew driving sources, such as a motor which operates the detection means 12, to the fire-extinguishing robot 1, the temperature information within a fixed visual field can be directly incorporated for the decision means 13. Therefore, the fire-extinguishing robot's 1 lightweight-ization is attained, and even if it does not install the transit track of dedication, autonomous transit on the outdoors is realizable.
[0021] In this way, if infrared distribution can be found, with the decision means 13, this is memorized in the ambient-temperature storage section as a temperature image within a fixed visual field by the well-known image processing technique, feature-extraction processing is performed in this temperature image, and the elevated temperature part or the part which reached combustion temperature can be specified in the pyrosphere judging section. Then, it presumes that this particular part is the source F of a fire, and the migration direction of the other sake is shown to this particular part in the migration directions section from the current position at the migration means 14.
[0022] And a fire extinguisher can be intensively sprinkled to the origin of a fire part of the source F of a fire toward the source F of a fire with the migration means 14 along this migration direction. While being able to perform fire fighting which combined with the autonomous transit mentioned above and became independent by this, the source F of a fire can be extinguished saving a fire extinguisher.
[0023] Drawing 2 is drawing explaining an example at the time of using for the fire extinguishing system of a highway the fire-extinguishing robot which shows drawing 1 . Although the case where the automobile fire by the traffic accident breaks out on the road surface 50 of the single-sided lane of Highway R is hereafter described as an example, you may apply to the fire a railroad line top and in a tunnel, the fire of the aircraft in an airport, etc.
[0024] In this fire extinguishing system, the hangars 61 and 62 of the fire-extinguishing robot 1 which has an entrance are repeated and installed in the road surface 50 direction at fixed spacing at the side

attachment wall 51 of each road surface 50 and 50. Moreover, two or more fire detectors 71-73 of the shape of the pole which tells the disaster prevention center which does not open and illustrate spacing narrower than this about a fire are set up.

[0025] The fire-extinguishing robot 1 is made to stand by from always, since the fireman who ran is dangerous to remainder, when not bringing close to the source of a fire, the fire-extinguishing robot 1 is taken out from hangars 61 and 62, the starting switch is turned on, and fire fighting is made to perform in these hangars 61 and 62 instead of human being. Preferably, put side by side monitor means, such as a CCD camera and a walkie-talkie, to the fire-extinguishing robot 1, send a circumference image to a disaster prevention center or a motor fire engine, and induction directions are made to be received, and you may make it run, avoiding the surrounding obstruction 80.

[0026] The same detection means 12 of the source F of a fire as the fire-extinguishing robot 1, the means of communications 11 for the fire-extinguishing robot 1, and the decision means 13 of the source F of a fire are formed in the stanchion of each fire detector 71-73. An infrared detection means 101 to mention later for this detection means 12 is built in the point of said stanchion, and it is made the arrangement which turned the sensing side of that infrared radiation in the road surface 50 direction. In addition, the fire information means by the alarm button same instead of the detection means 12 and the decision means 13 as a common fire detector may be established.

[0027] According to this fire extinguishing system, the direction of the source F of a fire is decided with the decision means 13 of the fire detectors 71-73 mentioned above, on the criteria map of the supervised area beforehand prepared by still better known triangulation, coordinate transformation is carried out and the location of the source F of a fire on a road surface 50 is pinpointed. For this reason, that positional information can be notified to the fire-extinguishing robot 1 or a disaster prevention center by means of communications 11.

[0028] In this case, although each supervised area is made to correspond, one hangar 61 nearest to the pinpointed source F of a fire is chosen as each fire detectors 71-73 and the positional information of the source F of a fire is beforehand sent to that fire-extinguishing robot 1, it does not notify to another hangar 62. Furthermore, it confirms that the fire-extinguishing robot 1 is storing, and starting directions are given. For this reason, there is no clumsiness of starting the unnecessary fire-extinguishing robot 1, or delaying initiation of fire fighting accidentally.

[0029] If the fire-extinguishing robot 1 receives this notice, migration will be started based on directions of a fire detector 72, and the positional information of the source F of a fire. What is necessary is just to extinguish the fire, making the normal coordinate of the fire-extinguishing area (for example, the supervised area of the fire detector 72 mentioned above is assigned) in its duty memorize beforehand, carrying out coordinate transformation of the positional information from a fire detector 72 on a normal coordinate, and making the fire-extinguishing robot 1 operate the migration means 14 toward that specific coordinate at this time. Thereby, migration control of a cheap configuration is realizable.

[0030] In addition, while carrying well-known satellite communication equipment in the fire-extinguishing robot 1 and pinpointing the fire-extinguishing robot's 1 current position periodically according to satellite navigation, this specified positional information from the current position and a fire detector 72 may be made to collate. In this case, performing quick migration control in a higher precision, the source F of a fire can be made to be able to approach and fire fighting can be made to perform.

[0031] Moreover, shortly after being unable to start in a hangar 61, a course's being obstructed by a certain failure during migration or the situation where the fire-extinguishing robot 1 extinguishes the source F of a fire, and is not competent arising, it reports fire-extinguishing un-succeeding to a fire detector 72 or a disaster prevention center. For this reason, other fire-extinguishing robots 1 can be dispatched instead, or other emergency operation can be taken.

[0032] Drawing 3 is the block diagram of an example of the infrared detection means concerning this invention. This infrared detection means 101 piles up in order the detection substrate 110 which consists of a silicon semi-conductor, and that receipt object substrate 160 and the top-cover substrate 170 in the shape of sandwiches, joins, and makes the whole a three-tiered structure. The detection substrate 110 is

a semi-conductor substrate of the planar mold formed according to the semi-conductor manufacture process, and the receipt object substrate 160 and the top-cover substrate 170 are formed from borosilicate glass etc.

[0033] If the slot of the shape of two pairs of ******** is ****(ed) to a duplex both at home and abroad by anisotropic etching and a pair counters drawing right and left, the detection substrate 110 is made to counter the drawing upper and lower sides, and other pairs are arranged to it so that it may intersect perpendicularly with this. And the rocking seating rim 112 of the shape of a cross-section rectangle of that interior and the further plate-like rocking object 113 of that interior are formed for the same material at one on the same field as the outer frame 111 which consists of a rectangular frame, and this outer frame 111.

[0034] Turn the two rod-like supporting beam 114,115 to the inner direction, two points which counter the inner skin of an outer frame 111 and the rocking seating rim 112, respectively are made to project, and the opposite section of the rocking seating rim 112 or the rocking object 113 is built over the point. By this, the rocking seating rim 112 and the rocking object 113 were made into the so-called gimbal (Gimbal) structure of an outer frame 111 or the rocking seating rim 112 of supporting in the center section mostly and using for a compass etc., through each supporting beam 114,115 which intersects perpendicularly mutually. Moreover, rocking object 113 grade is sealed inside a three-tiered structure, and electric shielding protection is carried out from the open air or dust.

[0035] Furthermore, a rod twists, and both the supporting beams 114,115 have elasticity in the direction, and support the rocking object 113 possible [an inclination] as the 2nd revolving shaft X which intersects perpendicularly the supporting beam 115 of another side with the 1st revolving shaft Y in the rocking seating rim 112 again by setting the 1st revolving shaft Y as one supporting beam 114. For this reason, the rocking seating rim 112 and the rocking object 113 can be inclined independently to an outer frame 111, respectively.

[0036] Drawing 4 is the top view of the silicon semi-conductor substrate shown in drawing 3 . Make one plate surface of the rocking seating rim 112 approach the periphery section, it is made to go the rocking seating rim 112 around, and the 1st coil 120 is formed in it with a electrocasting coil magnetization method. This 1st coil 120 is what covered that front face with the insulating layer, pulls out both that wiring edge on the field by the side of [same] an outer frame 111 through one supporting beam 115, and forms the 1st electrode terminal 121,121 of a pair on this field.

[0037] Formation covering of the 2nd coil 130 is carried out similarly, the both ends are pulled out on an outer frame 111 through the supporting beam 115 of another side, the rocking seating rim 112, and a supporting beam 114, and the 2nd electrode terminal 131,131 of a pair is similarly formed in the field of the same side of the rocking object 113.

[0038] An infrared sensing means 140 to mention later in the center section on the rocking object 113 is formed in the interior surrounded by the 2nd coil 130, and it attaches on the intersection of the 1st revolving shaft Y and the 2nd revolving shaft X, turning the sensing side to drawing this side. By this, since the sensing side of the infrared sensing means 140 can be inclined around the 1st and 2nd revolving shafts Y and X, the look can be everywhere scanned in a lengthwise direction and a longitudinal direction within a fixed visual field.

[0039] Moreover, from the infrared sensing means 140, those two signal output terminals are further pulled out on an outer frame 111 through one of the supporting beams 114,115 by wiring the rear face of the rocking object 113 through a through hole, and the electrode terminal 141,141 for components of a pair is formed on this field.

[0040] Drawing 5 is a 5-5 line sectional view shown in drawing 4 , and drawing 6 is a 6-6 line sectional view shown in drawing 4 . By ultrasonic machining, establish crevices 161 or 171 in a center section, respectively, both [these] the crevices 161,171 are made to counter, and the receipt object substrate 160 and the top-cover substrate 170 are joined to the receipt object substrate 160 and the top-cover substrate 170 on both sides of the detection substrate 110 in between. Moreover, the infrared translucent part 172 is formed in the plate surface center section of the top-cover substrate 170.

[0041] The disc-like permanent magnets 191,193,195,197 or 192,194,196,198 which became a pair two

pieces at a time, respectively are formed in each external surface of the receipt object substrate 160 and the top-cover substrate 170. the [and / according to this invention by two pairs of permanent magnets 191,193 with which the top-cover substrate 170 counters, and two pairs of permanent magnets 192,194 with which the receipt object substrate 160 counters] -- 1 permanent field is formed. moreover, two pairs of permanent magnets 195,197 with which the top-cover substrate 170 counters and two pairs of permanent magnets 196,198 with which the receipt object substrate 160 counters -- the -- it attaches so that 2 permanent field may be formed.

[0042] similarly at this time, it is shown in permanent magnet 191,193 and two pairs of permanent magnets 196,198 of the receipt object substrate 160 shown in drawing 5 which are shown in two pairs of permanent magnets 195,197 of the top-cover substrate 170 which counters the longitudinal direction shown in drawing 5 , or drawing 6 , or drawing 6 -- similarly, that polarity is carried out reversely and permanent magnet 192,194 are attached. For example, N pole of the permanent magnets 195 and 198 shown in drawing 5 and the south pole of permanent magnets 197 and 196 are turned to the detection substrate 110, and are arranged.

[0043] Moreover, the sense of the magnetic flux is arranged for two pairs of permanent magnets 195,196 which counter in the vertical direction shown in drawing 5 , 197,198, two pairs of permanent magnets 191,192 shown in drawing 6 , and 193,194, and 195,196 and 197,198 relative positions of both permanent magnets are shifted and attached in the longitudinal direction of each drawing. For example, N pole of permanent magnets 195 or 198 and the south pole of permanent magnets 196 or 197 are made to counter on both sides of the detection substrate 110, and, moreover, the relative position of both the permanent magnets 195,196 and 197,198 is shifted and arranged to the longitudinal direction of a drawing.

[0044] It can be made to form by such arrangement, so that the both-sides edge of the 1st and 2nd coils 120,130 may be crossed, making parallel use each magnetic flux as the detection substrate 110 in the both-sides edge of the 1st coil 120 of the rocking seating rim 112, or the 2nd coil 130 of the rocking object 113.

[0045] Drawing 7 is drawing explaining an example of the installation structure of the infrared sensing means shown in drawing 3 - drawing 6 . This infrared sensing means 140 began to detect the source of a fire, and was suitable for applications, such as discovery of the invader in a fixed area, for example, is infrared sensing element 140A which consists of a semi-conductor bare chip.

[0046] In the center section on the rocking object 113, the crevice 141 of the configuration which contains the inferior surface of tongue of infrared sensing element 140A is ****(ed), and one land 142 for wiring of one signal output terminal of infrared sensing element 140A is formed in the inner base of this crevice 141. Moreover, on the rocking object 113 of crevice 141 perimeter, the land 143 of another side for wiring of the signal output terminal of another side is formed. From each land 142,143, a printed circuit is carried out to the electrode terminal 141,141 for components through each through hole and the wiring 144,144 on the back.

[0047] Thus, in the crevice 141 of the formed rocking object 113, an infrared sensing element 140A inferior surface of tongue is inserted, and it aligns at the intersection of the 1st and 2nd revolving shafts Y and X, and it fixes on the rocking object 113 so that the location gap of the sensing side may not be carried out through conductive adhesives towards the upper part of a drawing, making it parallel to the 1st and 2nd revolving shafts Y and X. Furthermore, ultrasonic welding is carried out by the joining tool of dedication of a gold streak 145 etc. from the land 143 of said another side on the sensing side of infrared sensing element 140A. Moreover, although the perimeter of infrared sensing element 140A is sealed by the transparent protection material 146, such as synthetic resin, about the material of this protection material 146, it chooses in consideration of the wavelength of the infrared radiation made to penetrate.

[0048] Then, an operation of this infrared detection means 1 is explained. If the drive current over the 1st and 2nd revolving shafts Y and X is supplied to the infrared detection means 101, this drive current will reach the 1st coil 120 or the 2nd coil 130 through the printed wiring on the 1st and 2nd electrode terminals 121,121,131,131 and the detection substrate 100, and the electromagnetic field accompanying

a drive current will arise at each both-sides edge with the 1st and 2nd coils 120,130. Moreover, the permanent field mentioned above is beforehand formed by two pairs of permanent magnets 195,196 and 197,198, or 191,192 and 193,194.

[0049] For this reason, in the both-sides edge of the 1st and 2nd coils 120,130, the angular moment which magnetic force F acted according to the Flemming left-hand rule, and the angular moment which made the 1st revolving shaft Y the axial center arose in the rocking seating rim 112 according to the Lorentz force by this magnetic force F, and made the 2nd revolving shaft X the axial center at the rocking object 113 arises.

[0050] If the rocking seating rim 112 and the rocking object 113 are rotated, these angular moments will lean until they balance with the spring reaction force accompanying a twist of both the supporting beams 114,115 and reach a fixed tilt angle in the rocking seating rim 112 and the rocking object 113. For this reason, if a suitable drive current is introduced into the 1st and 2nd coils 120,130, the rocking seating rim 112 or the rocking object 113 can be leaned to the tilt angle of arbitration by making into an axial center the 1st or 2nd revolving shaft Y and X which intersects perpendicularly mutually.

[0051] Therefore, the inside of a fixed visual field can be scanned everywhere, making the sensing side of the infrared sensing means 140 in agreement with each tilt angle, leaning it, and turning the look of the infrared sensing means 140 towards desired according to this inclination. That is, besides the infrared detection means 101, it is not necessary to prepare any driving means outside.

[0052] It may have the displacement detection function of [above tilt angle of the rocking seating rim 112 and the rocking object 113 or else], and each tilt angle may be further adjusted to a precision. According to this, whether a certain extraneous vibration works, and a tilt angle produces flattery delay to the installed infrared detection means 101 compared with a drive current or the variation on manufacture arises in the spring reaction force by both the supporting beams 114,115, the effect is suppressed to the minimum and the adjustment control of the tilt angle can be carried out within fixed limits.

[0053] Then, the example of 1 configuration of this displacement detection function is described. The printed circuit of two pairs of sensing coils L11 and L12 arranged on the inferior surface of tongue of the receipt object substrate 160 so that an electromagnetic coupling may be carried out to the 1st and 2nd coils 120,130, respectively, or L21 and L22 is carried out. Among these, one sensing coils L11 and L12 of each are arranged to the position of symmetry on both sides of the 1st revolving shaft Y of the rocking seating rim 12, and each sensing coils L21 and L22 of another side are arranged to the position of symmetry on both sides of the 2nd revolving shaft X of the rocking object 113.

[0054] Since a mutual conductance with the 1st coil 120 changes according to the tilt angle of the rocking seating rim 112 or the rocking object 113, they can compute a tilt angle by each sensing coils L11 and L12, and L21 and L22 detecting this variation. That is, it is made to superimpose on the drive current of the 1st or 2nd coil 120,130, and each sensing coils L11 and L12, or L21 and L22 are made to generate the induced current for the alternating current for detection by the sink and this alternating current. And by change of this induced current, change of a mutual conductance can be detected and each tilt angle can be computed from that result.

[0055] Drawing 8 is the circuit diagram of an example of the tilt-angle detector of the rocking object shown in drawing 3 - drawing 6 . This tilt-angle detector arranges each sensing coils L11 and L12 (in the case of this Fig.), or L22 and L22 to two sides which a quadrilateral adjoins, arranges two resistance R1 and R2 to a serial at other two sides, and constitutes the bridge circuit.

[0056] In this bridge circuit, the midpoint of both the sensing coils L11 and L12 and the midpoint of both resistance R1 and R2 are used as two constant-voltage input edges, and predetermined AC power supply E is connected to both [these] the input edge. Moreover, both the midpoints of sensing coils L11 or L12 and resistance R1 or R2 are used as two balanced outgoing ends, and two input edges of well-known differential-amplifier AMP are connected to both [these] the balance outgoing end. And each sensing coils L11 and L12, and the wiring direction and value of resistance R1 and R2 are determined that a bridge circuit will balance when the 1st coil 120 serves as an parallel location to both the sensing coils L11 and L12.

[0057] If the mutual conductance of each sensing coils L11 and L12 mentioned above changes from equilibrium to a condition out of balance relatively according to this detector, since the potential difference between said both midpoints will change to a value out of balance according to this change of state, the output of differential-amplifier AMP can also change in connection with this, and the detection output S of the positive/negative according to a tilt angle can be obtained.

[0058]